Lecture-4

IP Addresses

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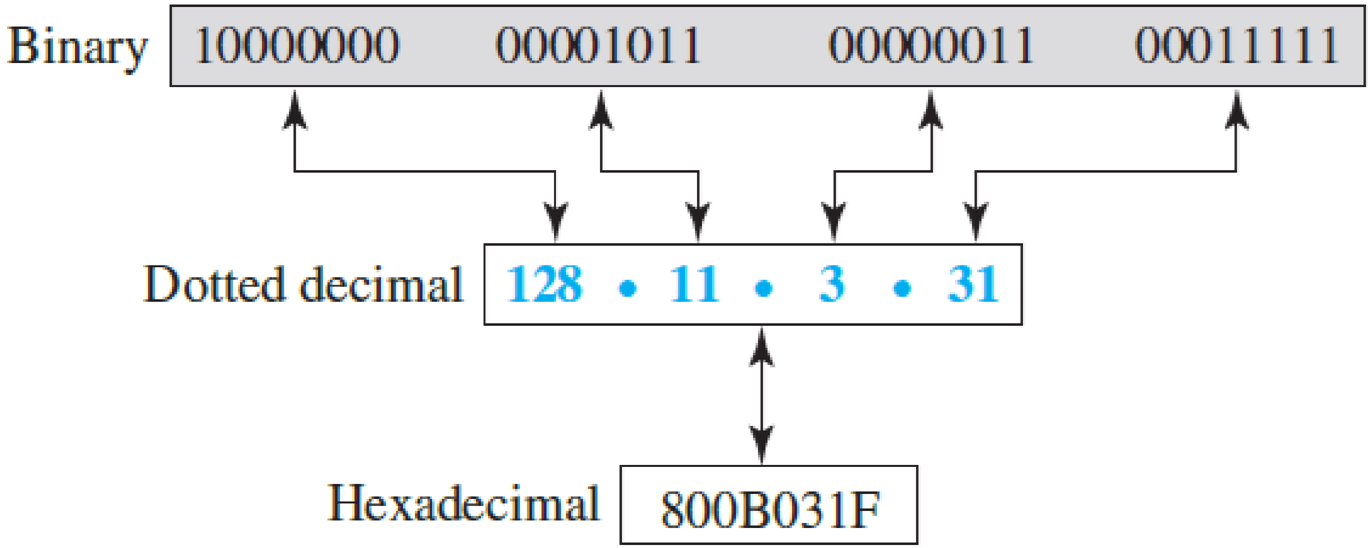
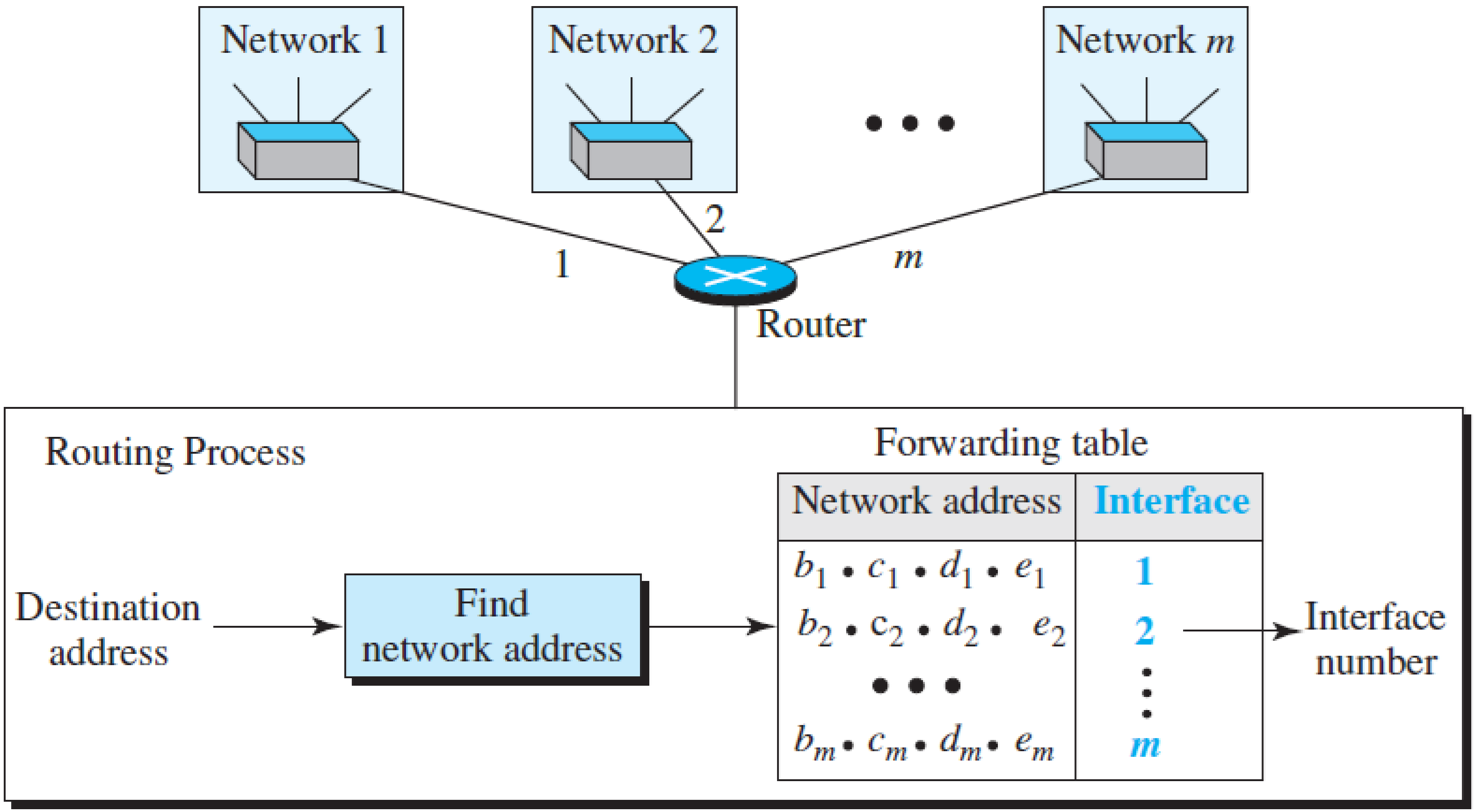
There are three common notations to show an IPv4 address: binary notation, dotted-decimal notation, and hexadecimal notation. In *binary notation*, an IPv4 address is displayed as 32 bits.

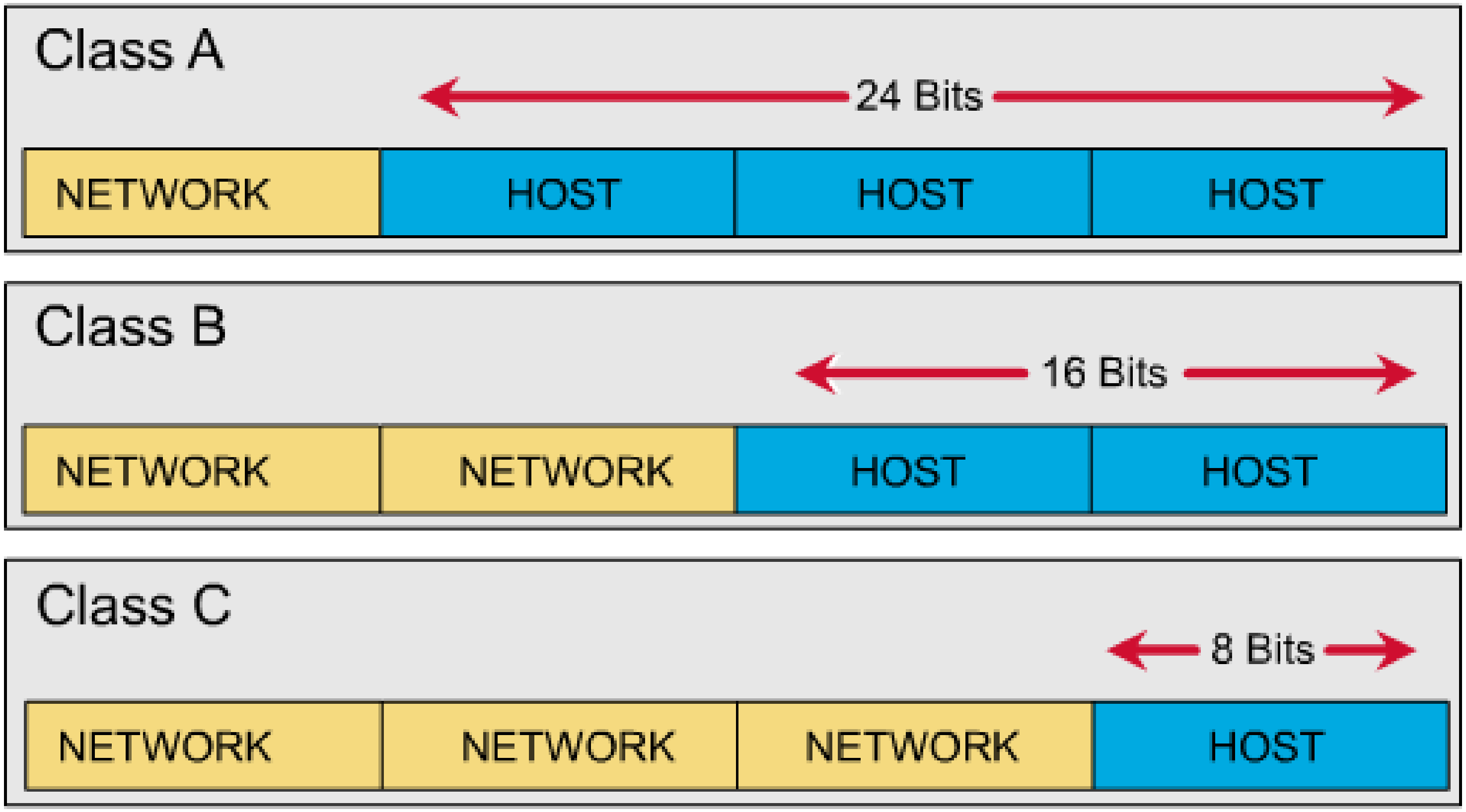


Three different notations in IPv4 addressing

When a packet arrives at the router from any source host, the router needs to know to which network (or interface) the packet should be sent.



Network address



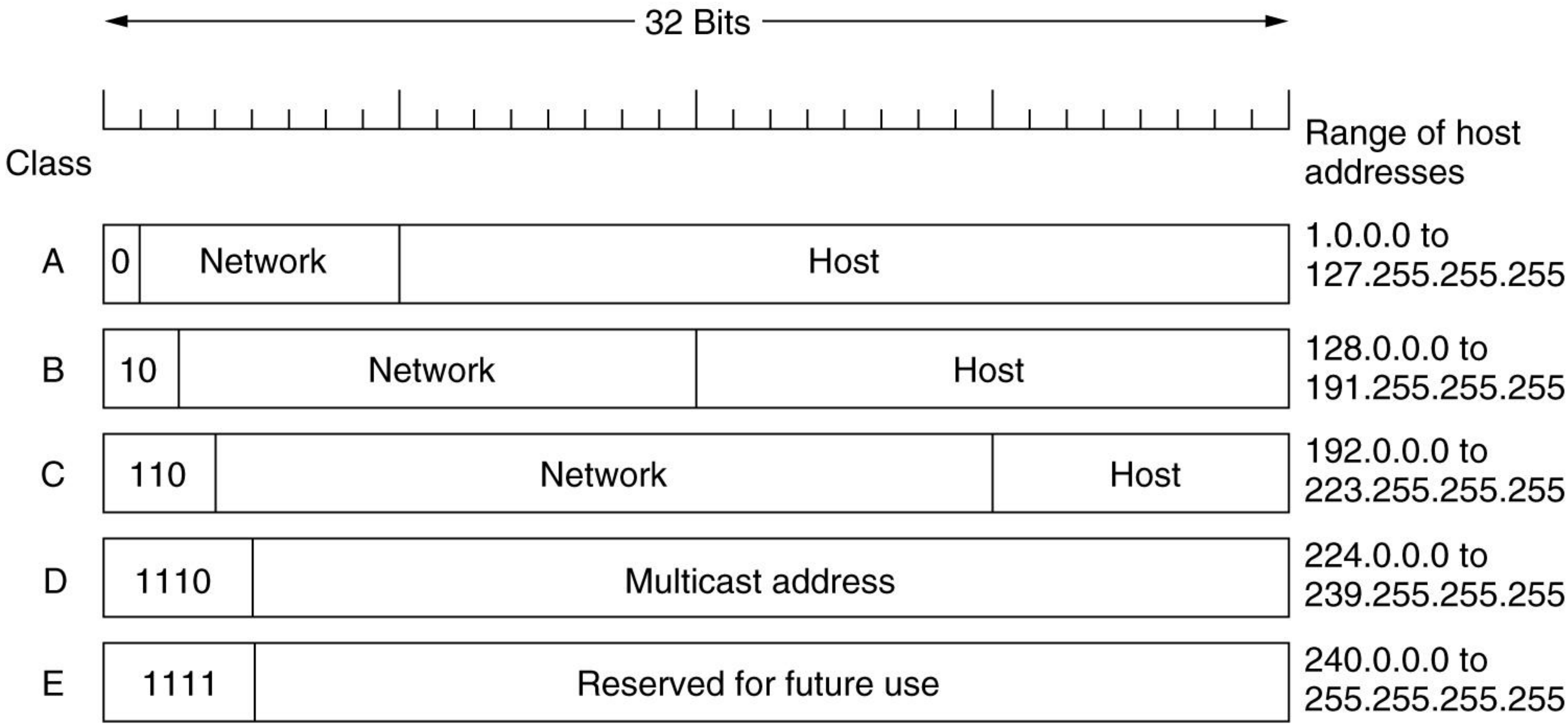
Class A (24 bits for hosts) $2^{24} - 2^{*} = 16{,}777{,}214$ maximum hosts

Class B (16 bits for hosts) $2^{16} - 2^{*} = 65{,}534$ maximum hosts

Class C (8 bits for hosts) $2^{8} - 2^{*} = 254$ maximum hosts

* *Subtracting the network and broadcast reserved address*

Range of IP Addresses

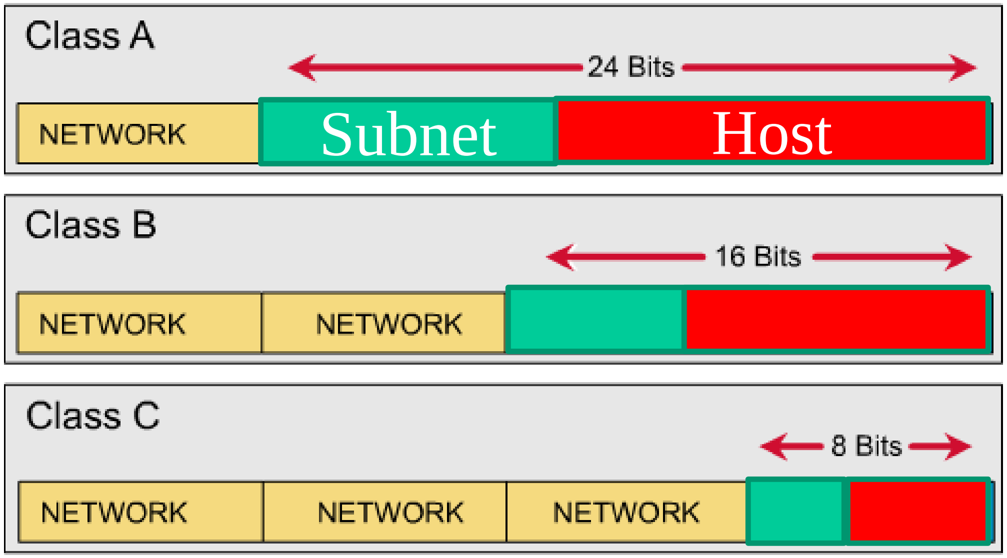


IP address is written in dotted decimal format like: **192.168.2.21**

Subnets

✓An IP address has two components, the **network address** and the **host address**. A subnet mask separates the IP address into the network and host addresses (**<network> <host>**).

✓Subnetting can further divides the host part of an IP address into a subnet and host address (**<network> <subnet> <host>**).



1 1 1 1 1 1 1 1. 1 1 1 1 1 1 1 1. 1 1 1 1 1 1 1 1. 1 1 1 0 0 0 0 0

Subnet Mask

✓A Subnet mask is a 32-bit number that masks an IP address and divides the IP address into **network address** and **host address**. Subnet Mask is made by setting network bits to all "1"s and setting host bits to all "0"s.

192.168.003.6

255.255.255.0

11111111. 11111111. 11111111. 00000000

✓A subnet mask is used to identify network address of an IP address by performing bitwise AND operation.

✓Within a given network, **two host addresses** are reserved for special purpose. The "0" address is assigned a **network address** and "255" is assigned to a **broadcast address**, and they cannot be assigned to a host.

The **default** subnet mask used for class A, B, and C are:

Class A: 11111111.00000000. 00000000. 00000000

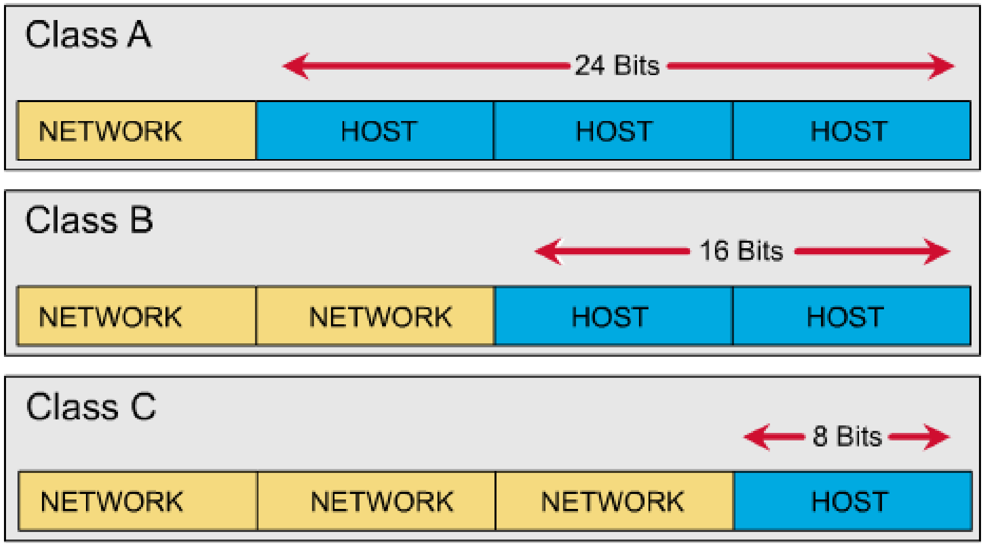
255.0.0.0

Class B: 11111111. 11111111. 00000000. 00000000

255.255.0.0

Class C: 11111111. 11111111. 11111111. 00000000

255.255.255.0



For example, we have a class C IP address of a host: **192.168.23.4** ANDing the IP address with default subnet mask **255.255.255.0** give the result of 192.168.23.0 which is the net ID part of the IP address.

11000000. 10101000. 00010111. 00000100

And

11111111. 11111111. 11111111.   00000000

\---

11000000. 10101000. 00010111. 0000000

= 192.168.23.0

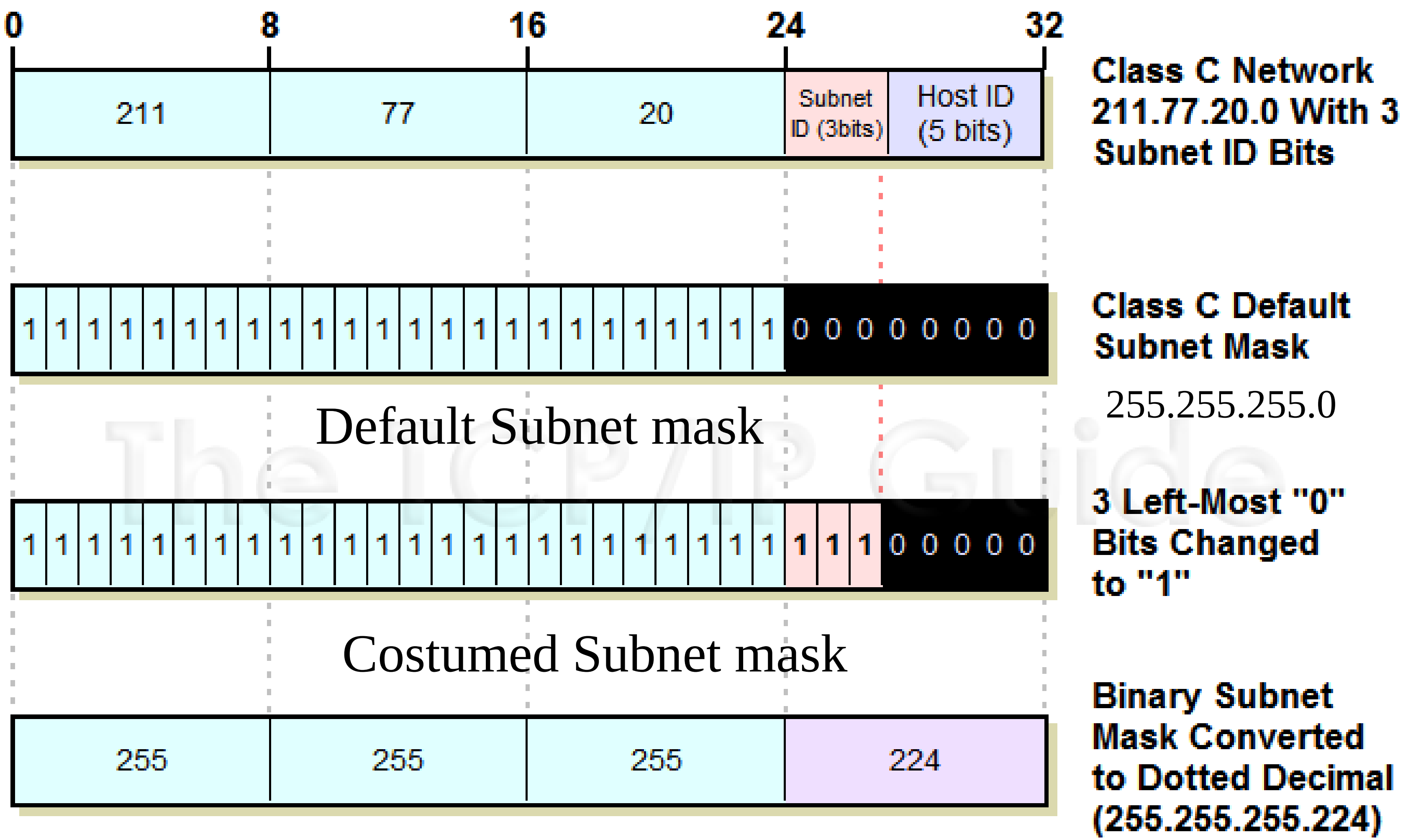
IP address AND Subnet mask = Network ID

How many host is possible against the class C network ID: 192.168.23.0?

The possible hosts will be:
192.168.23.1
192.168.23.2
192.168.23.3
192.168.23.4
…………….
192.168.23.254

192.168.23.0 and 192.168.23.255 are excluded as mentioned before. Therefore, the number of hosts is 2^8-2 = 254

✓Subnetting further divides the host part of an IP address into a subnet and host address (<network> <subnet> <host>).

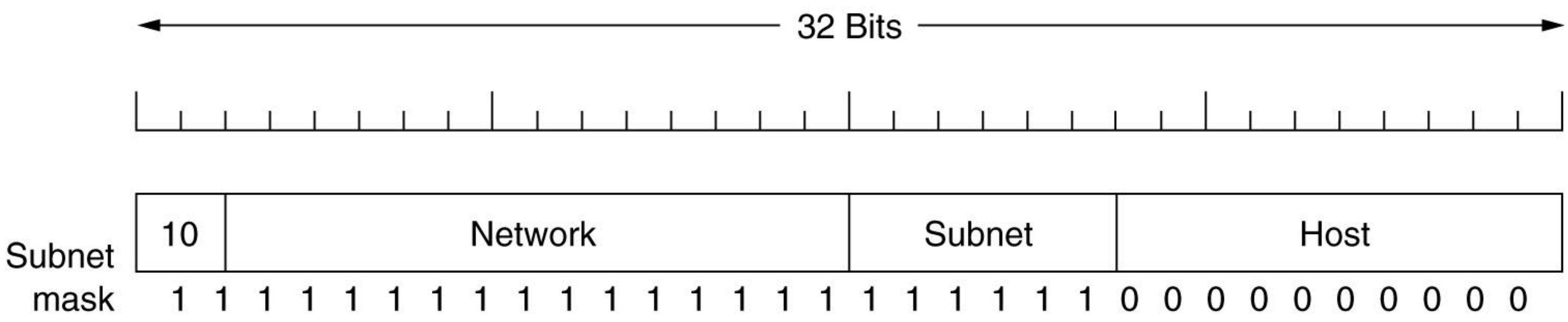


10000000→128
11000000→192
11100000→ 224
11110000→ 240
11111000→ 248

Subnet masks:
255.255.255.128
255.255.255.192
255.255.255.224
255.255.255.240
255.255.255.248

Example

The example of a customized subnet mask for class B is like:



A class B network subnetted into 64 subnets.

Example: Determine the number of subnet and host per subnet

Ans. The number of subnet = $2^6 = 64$

The number of hosts/subnet = $2^{10}-2= 1022$

Example-1

If the subnet mask 255.255.240.0 is used for a class B IP address then find the number of subnets and number of hosts/subnet.

Binary: 11111111 . 11111111 . 11110000 . 00000000

Decimal: 255.255.240.0

The number of hosts/subnet = $2^{12} – 2 = 4094$

The number of subnets = $2^4 = 16$

Example-2

If the subnet mask 255.255.255.192 is used for a class C IP address then fined the number of subnets and number of hosts/subnet.

The number of hosts/subnet = $2^6 – 2 = 62$

The number of subnets = $2^2 = 4$

Example-3

A class C IP address is 150.100.14.163 and the corresponding subnet mask is 255.255.255.128 Determine the maximum number of hosts per subnet and the number of subnets.

Ans. The subnet mask in both binary and decimal is like:

11111111. 11111111. 11111111. 10000000

255.255.255.128

Here 1 bits are for subnets and 7 bits for hosts.
Therefore, the number of hosts per subnet $2^7-2 = 126$
The number of subnets are $2^1= 2$

Example-3

Consider the custom subnet mask: 255.255.224.0 for a class B IP 191.1.0.0 where net ID is 191.1. Determine the possible **sub-network ID including subnet part**.

11111111	11111111	11100000	00000000

255	255	224	0

For each sub-net ID, put all 0s to user ID part, then convert the each byte to decimal shown in next slide.

Let we have class B IP address 191.1.0.0 where net ID is 191.1 then possible 8 subnets will be:

191	1	00000000	00000000

191.1.0.0

191	1	00100000	00000000

191.1.32.0

191	1	01000000	00000000

191.1.64.0

191	1	01100000	00000000

191.1.96.0

191	1	10000000	00000000

191.1.128.0

191	1	10100000	00000000

191.1.160.0

191	1	11000000	00000000

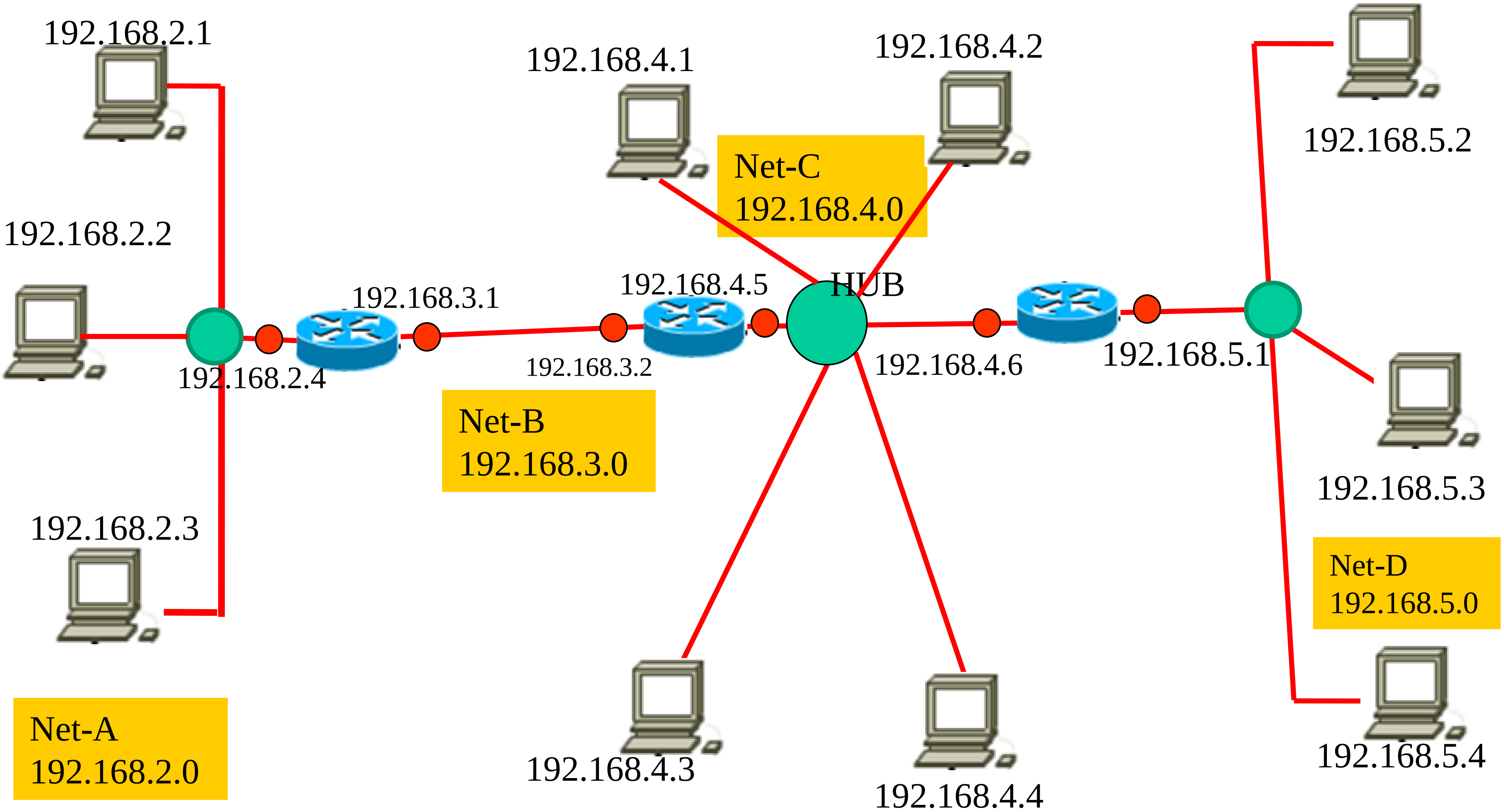
191.1.192.0

191	1	11100000	00000000

191.1.224.0

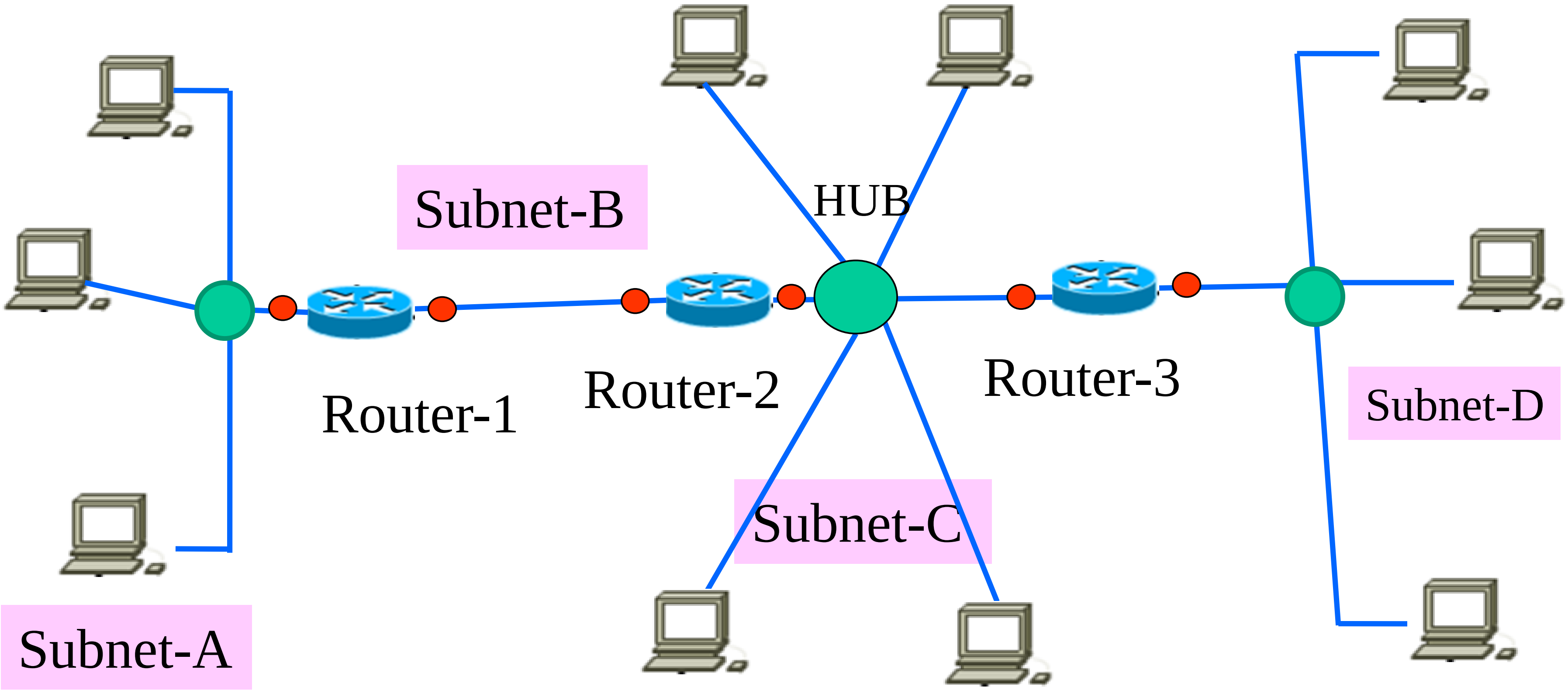
Examples

Example-1: Put default class C IP address to each node



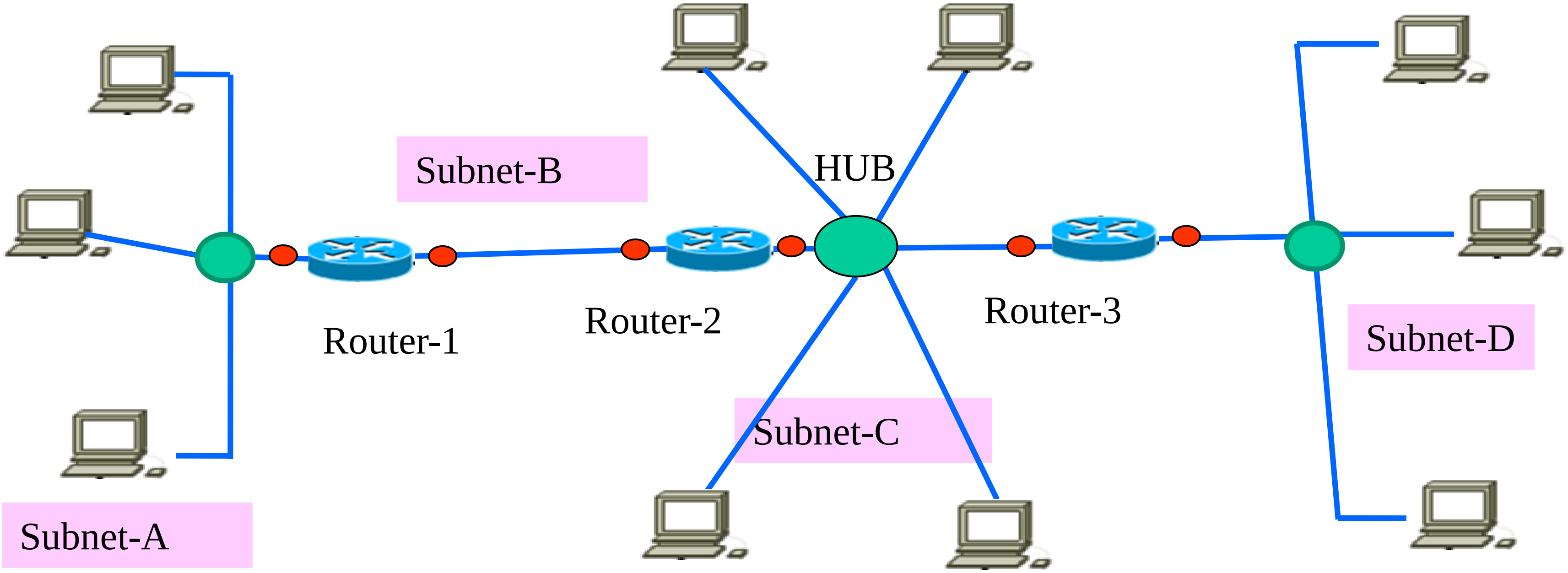
The drawback of the network is that it needs 4 IP address from ISP for 4 networks.

Example-2 Design the network with customized subnetting using single class B IP.



We have four subnets.

a) The subnet–A has four hosts (3 PCs and 1 router interface)
b) Subnet B has two hosts correspond to Fast Ethernet ports of router-1 and router-2 which are directly connected.
c) subnet-C has 6 hosts (4 PCs and 2 router interfaces)
d) subnet-D has 4 hosts (3 PCs and 1 router interface)



If we take 3 bits for the subnet ID (we can also take 2 bits for subnet for above network) of then we have $2^3 = 8$ subnets which is greater than 4 subnets of above figure. Considering class B IP address. Our custom subnet mask will be,

11111111	11111111	11100000	00000000

255	255	224	0

Q. Let we have class B IP address **191.1.0.0** where the net ID is **191.1**. Its default subnet mask is 255.255.0.0. The custom subnet mask 255.255.224.0 will provide 8 subnets like previous example:

11111111.11111111.**111**00000.00000000

191	1	00000000	00000000

Subnet ID-1: 191.1.0.0

191	1	00100000	00000000

Subnet ID-2: 191.1.32.0

191	1	01000000	00000000

Subnet ID-3: 191.1.64.0

191	1	01100000	00000000

Subnet ID-4: 191.1.96.0

191	1	10000000	00000000

Subnet ID-5: 191.1.128.0

191	1	10100000	00000000

Subnet ID-6: 191.1.160.0

191	1	11000000	00000000

Subnet ID-7: 191.1.192.0

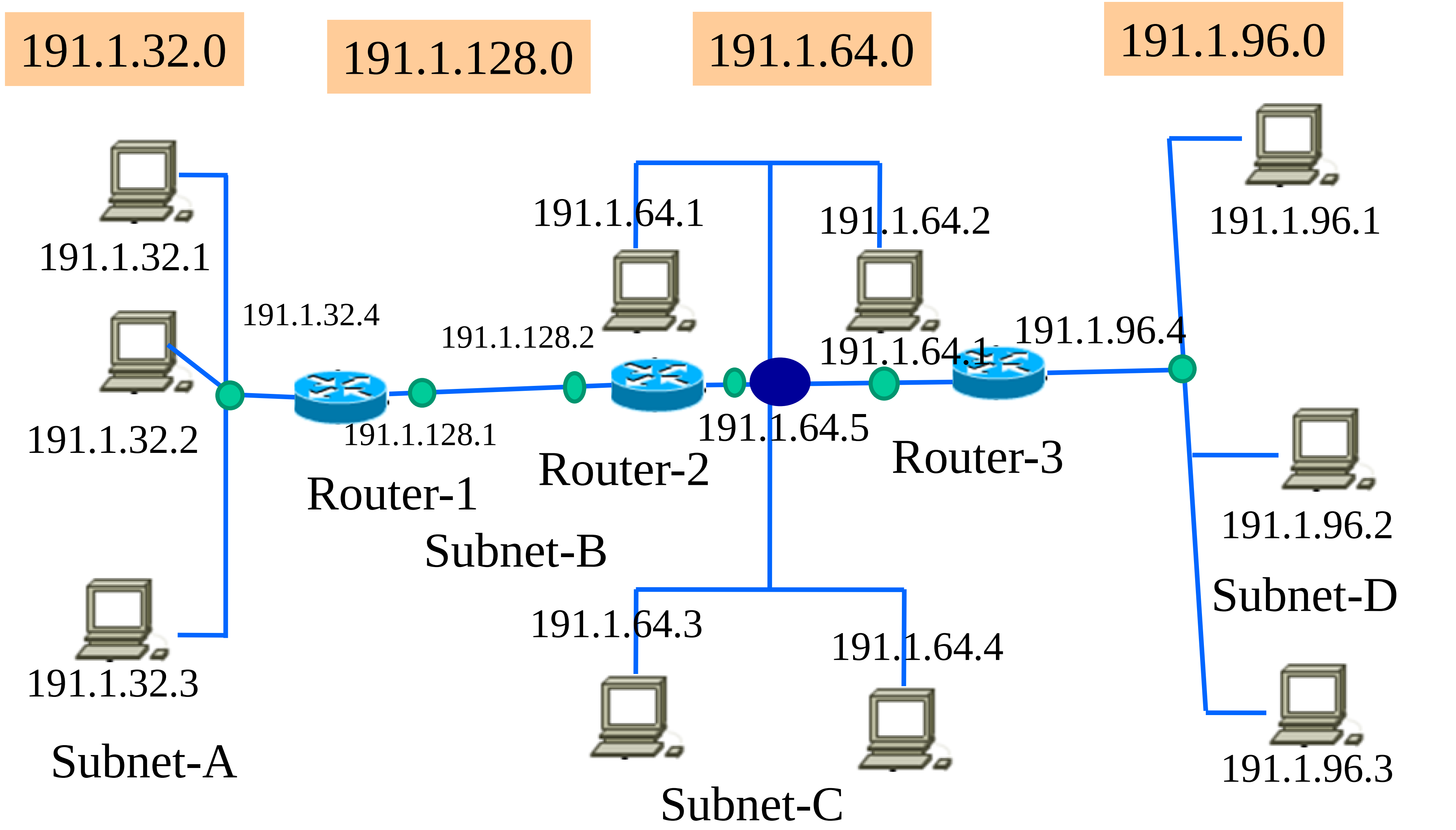
191	1	11100000	00000000

Subnet ID-8: 191.1.224.0

8 subnets

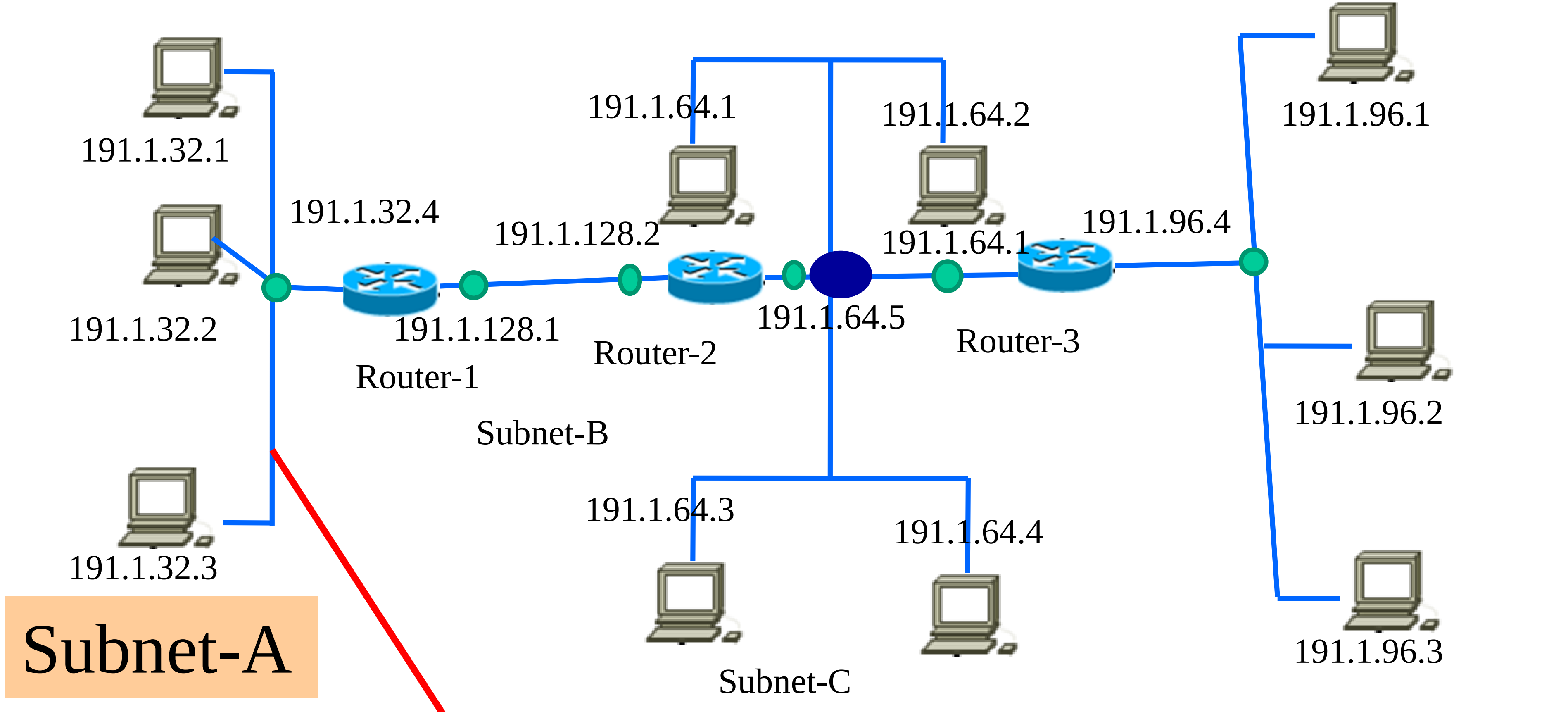
191.1.0.0
191.1.32.0
191.1.64.0
191.1.96.0
191.1.128.0
191.1.160.0
191.1.192.0
191.1.224.0

The subnet mask of the entire network is **255.255.224.0**



The advantage of the network is that it needs only one IP address from ISP and subnet mask of the entire network (for all the subnets) is fixed i.e. 255.255.224.0

191.1.0.0	191.1.128.0
191.1.32.0	191.1.160.0
191.1.64.0	191.1.192.0
191.1.96.0	191.1.224.0



Subnet-A

Subnet ID: 191.1.32.0

Subnet mask: 255.255.224.0

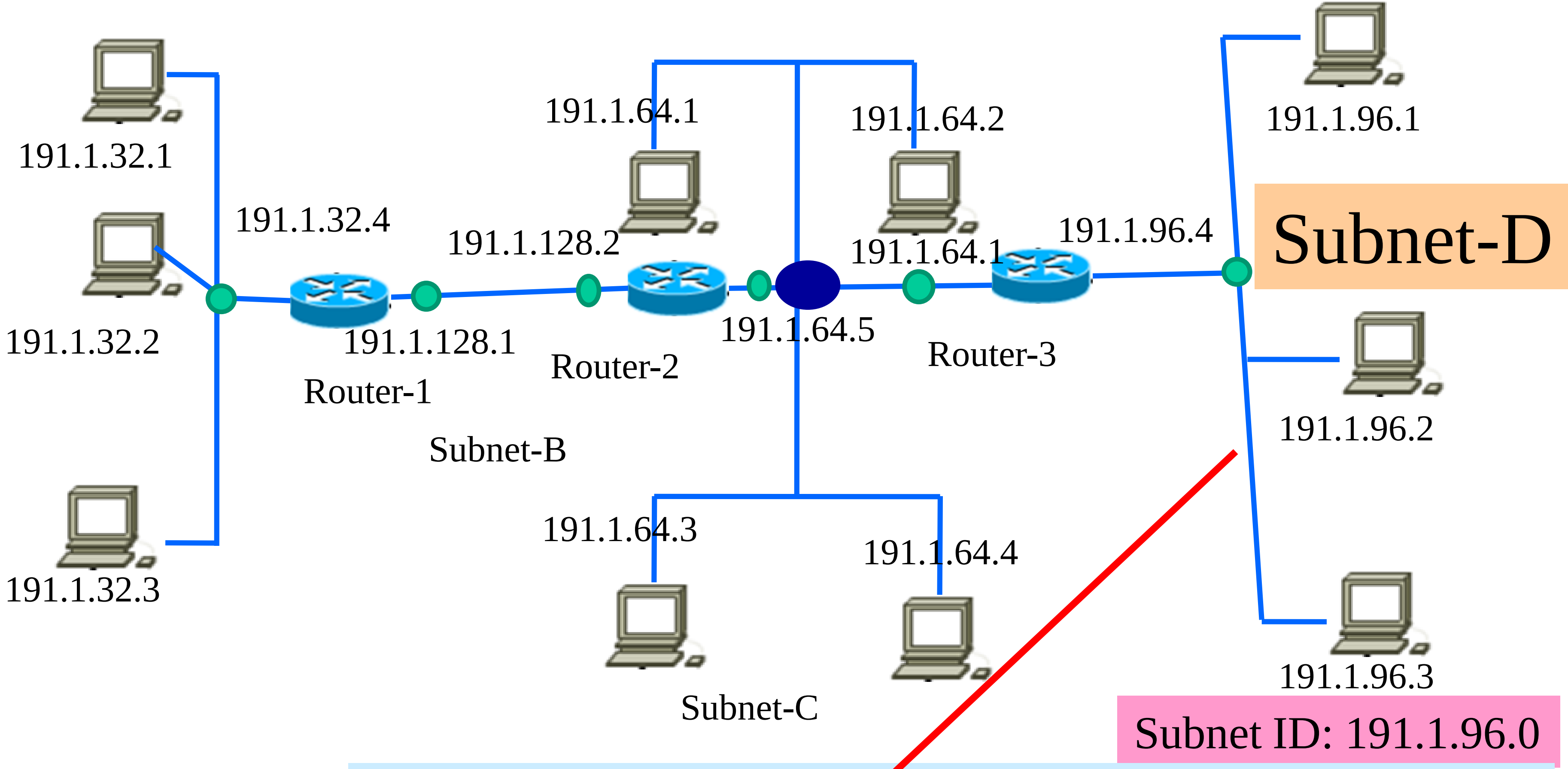
191.1.32.1 AND 255.255.224.0 = 191.1.32.0

191.1.32.2 AND 255.255.224.0 = 191.1.32.0

191.1.32.3 AND 255.255.224.0 = 191.1.32.0

191.1.32.4 AND 255.255.224.0 = 191.1.32.0

Therefore, any IP AND Subnet mask = subnet ID of subnet A



Subnet-C

Subnet ID: 191.1.96.0

Subnet mask: 255.255.224.0

191.1.96.1 AND 255.255.224.0 = 191.1.96.0

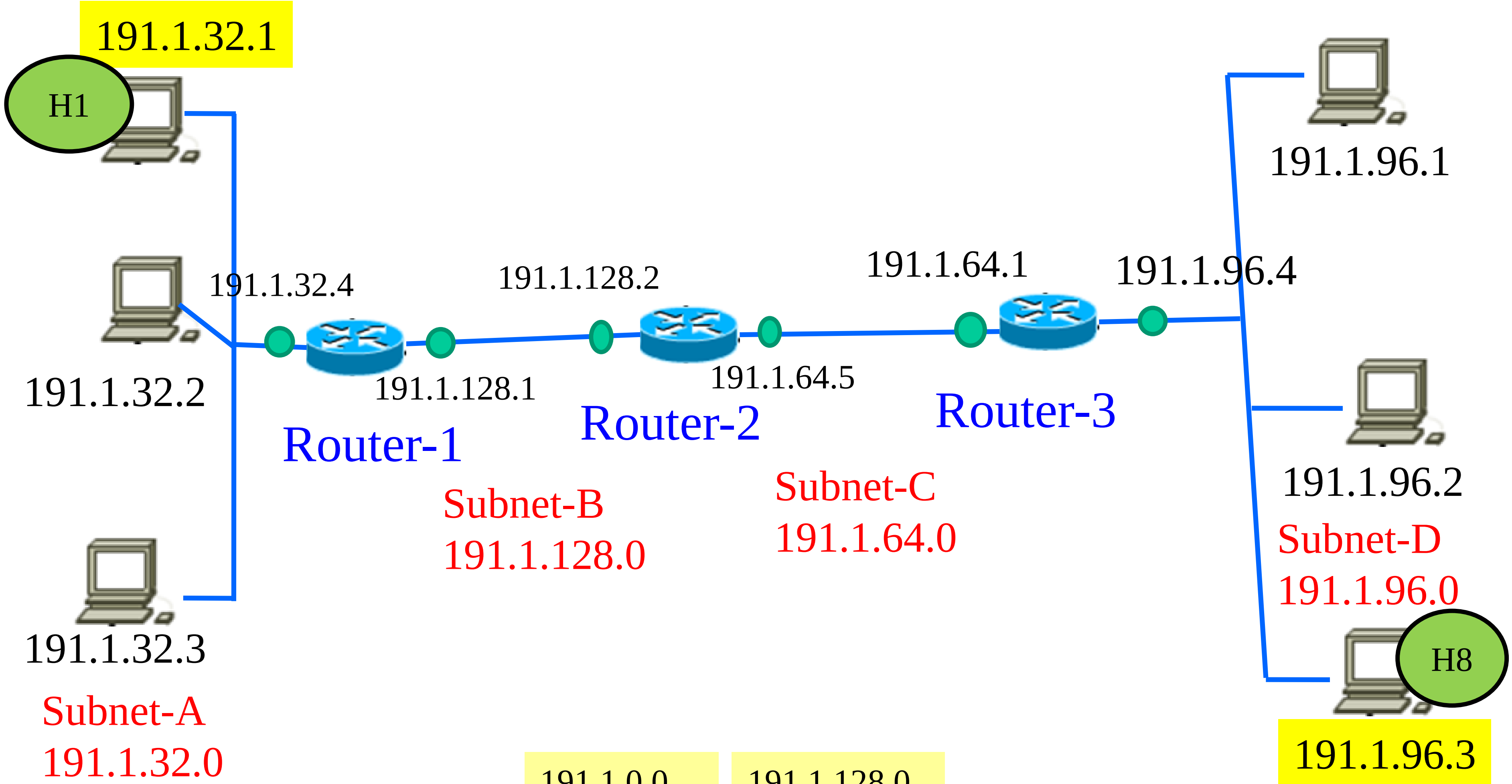
191.1.96.2 AND 255.255.224.0 = 191.1.96.0

191.1.96.3 AND 255.255.224.0 = 191.1.96.0

191.1.96.4 AND 255.255.224.0 = 191.1.96.0

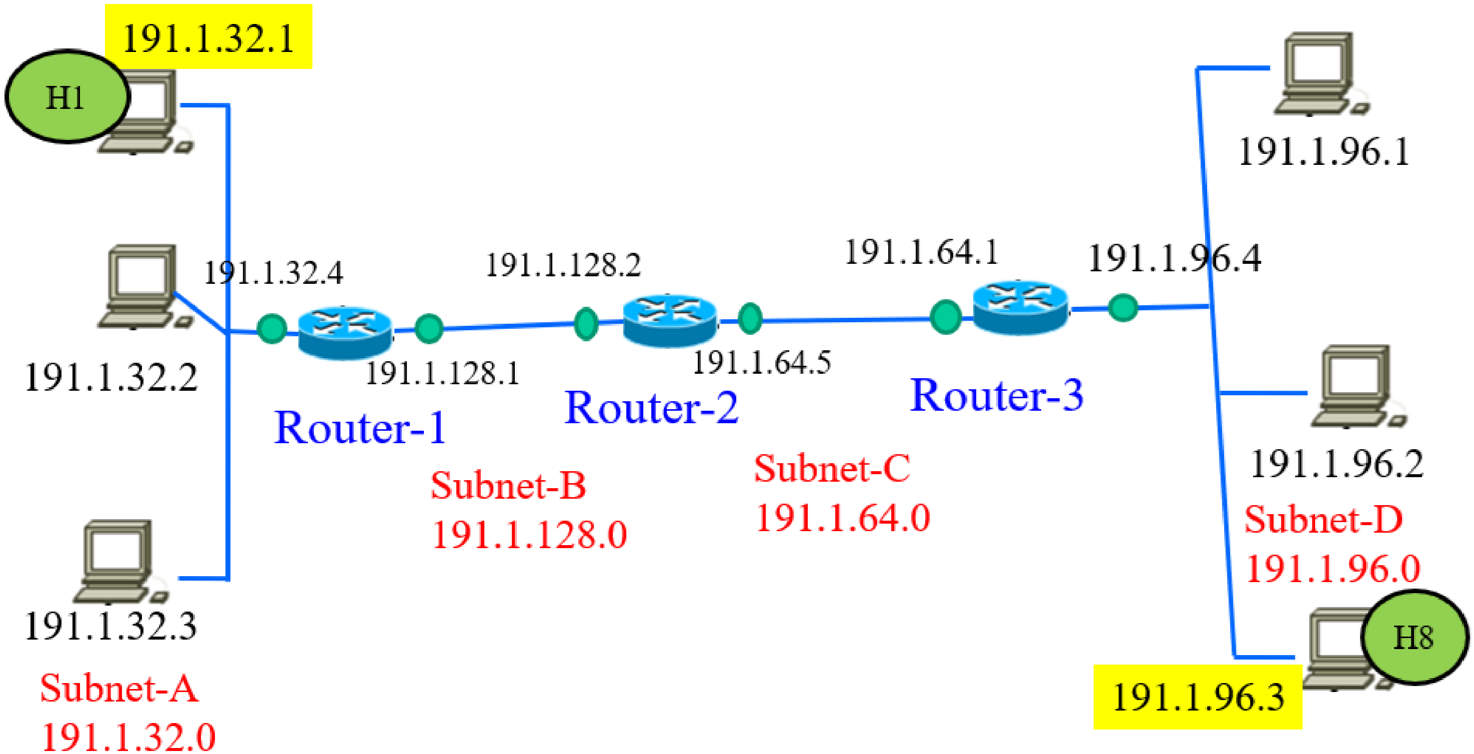
Therefore, any IP AND Subnet mask = subnet ID of subnet C

Q. The Subnet mask of entire network is: 255.255.224.0. Suppose the host H1 (IP of 191.1.32.1) wants to send a packet to host H8 (IP of 191.1.96.3). How routers will forward the packet to H8.



Possible subnets:

191.1.0.0	191.1.128.0
191.1.32.0	191.1.160.0
191.1.64.0	191.1.192.0
191.1.96.0	191.1.224.0



The Subnet mask of entire network is: 255.255.224.0. Suppose the host H1 (IP of 191.1.32.1) wants to send a packet to host H8 (IP of 191.1.96.3).

The Router-1: 191.1.96.3 AND 255.255.224.0 ≠ 191.1.32.0 (not for subnet-A)

The Router-1: 191.1.96.3 AND 255.255.224.0 ≠ 191.1.128.0 (not for subnet-B)

Therefore it will forward the packet to Router-2.

The Router-2: 191.1.96.3 AND 255.255.224.0 ≠ 191.1.64.0 (not for subnet-C)

Therefore it will forward the packet to Router-3.

The Router-3: 191.1.96.3 AND 255.255.224.0 = 191.1.96.0 (Destined for subnet-D)

The **possible hosts** for the subnet 191.1.32.0 (we may choose for the subnet-A of previous figure) will be,

191	1	001xxxxx	xxxxxxxx

Decimal	Binary
191.1.32.1	10111111.00000001.00100000.00000001
191.1.32.2	10111111.00000001. 00100000.00000010
191.1.32.3	10111111.00000001. 00100000.00000011
…………	………………………………………….
…………	………………………………………….
191.1.63.254	10111111.00000001. 00111111.11111110

Total number of hosts will be 2^{13}-2

The possible hosts for the subnet 191.1.64.0 (we may choose for the subnet-B of previous figure) will be,

191	1	010xxxxx	xxxxxxxx

Decimal	Binary
191.1.64.1	10111111.00000001.01000000.00000001
191.1.64.2	10111111.00000001.01000000.00000010
191.1.64.3	10111111.00000001.01000000.00000011
…………	………………………………………
…………	………………………………………
191.1.95.254	10111111.00000001.01011111.11111110

Total number of hosts will be 2^{13}-2

The possible hosts for the subnet 191.1.96.0 (we may choose for the subnet-C of previous figure) will be,

191	1	011xxxxx	xxxxxxxx

191.1.96.1	10111111.00000001.01100000.00000001
191.1.96.2	10111111.00000001.01100000.00000010
191.1.96.3	10111111.00000001.01100000.00000011
………….	………………………………………..
………….	………………………………………..
191.1.127.254	10111111.00000001.01111111.11111110

Total number of hosts will be 2^{13}-2

The possible hosts for the subnet 191.1.128.0 (we may chose for the for the point to point link of Router-1 and Router-2 of previous figure) will be,

191	1	100xxxxx	xxxxxxxx

191.1.128.1	10111111.00000001.10000000.00000001
191.1.128.2	10111111.00000001. 10000000.00000010
191.1.128.3	10111111.00000001. 10000000.00000011
………….	…………………………………………..
………….	…………………………………………..
191.1.159.254	10111111.00000001. 10011111.11111110

Total number of hosts will be 2^{13}-2

The possible hosts for the subnet 191.1.160.0 (we may chose for the for the point to point link of Router-1 and Router-2 of previous figure) will be,

191	1	101xxxxx	xxxxxxxx

191.1.160.1	10111111.00000001.10100000.00000001
191.1.160.2	10111111.00000001.10100000.00000010
191.1.160.3	10111111.00000001.10100000.00000011
………….	…………………………………………..
………….	…………………………………………..
191.1.191.254	10111111.00000001.10111111.11111110

Total number of hosts will be 2^{13}-2

The possible hosts for the subnet 191.1.192.0 (we may chose for the for the point to point link of Router-1 and Router-2 of previous figure) will be,

191	1	110xxxxx	xxxxxxxx

191.1.192.1	10111111.00000001.11000000.00000001
191.1.192.2	10111111.00000001.11000000.00000010
191.1.192.3	10111111.00000001.11000000.00000011
………….	……………………………………..
………….	……………………………………..
191.1.223.254	10111111.00000001.11011111.11111110

Total number of hosts will be 2^{13}-2

The subnets and possible host IDs are shown below.

Subnet	**1^{st} host ID**	**Last host ID**
191.1.32.0	191.1.32.1	191.1.63.254
191.1.64.0	191.1.64.1	191.1.95.254
191.1.96.0	191.1.96.1	191.1.127.254
191.1.128.0	191.1.128.1	191.1.159.254
191.1.260.0	191.1.160.1	191.1.191.254
191.1.192.0	191.1.192.1	191.1.223.254

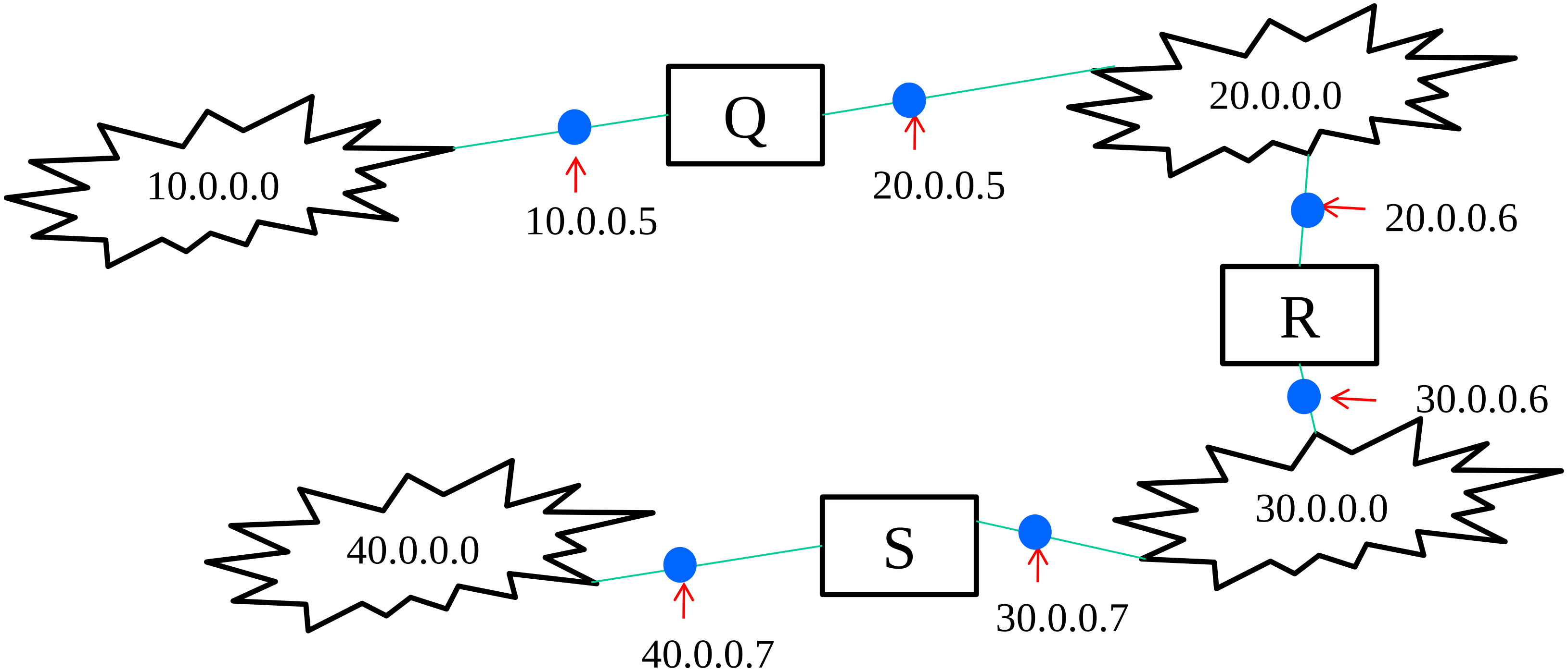
From above table we get two formulas:

The 1^{st} host ID = subnet ID + 1

The last host ID of a range = next subnet ID - 2

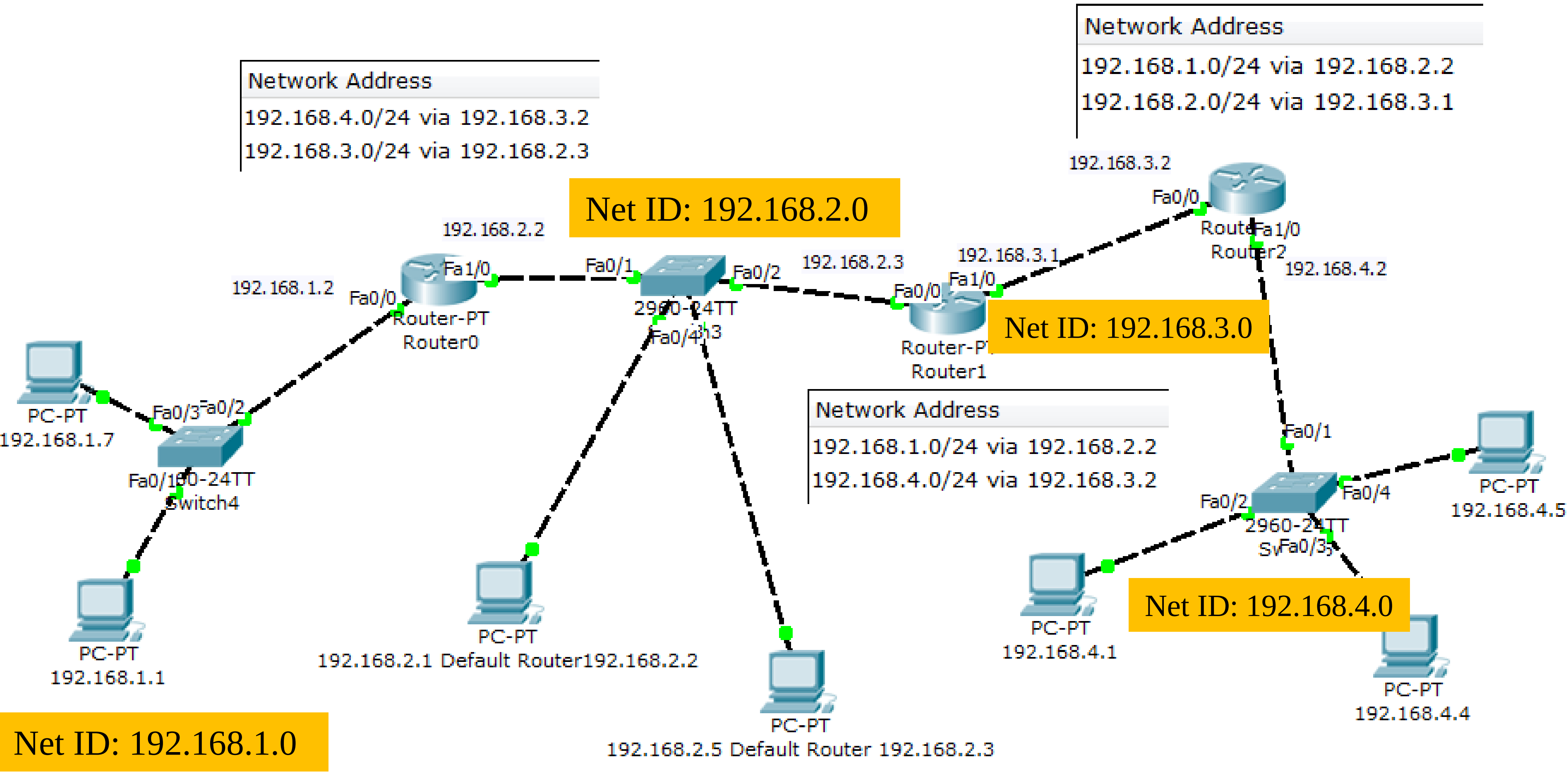
Typically, a routing table contains pair (*N*, *R*) where *N* is the net ID of the destination network and R is the IP address of the next router along the path to network N.

Example-4 Show the routing table of router R.



Routing table of R

To Reach Hosts on Network	**Route to this address**
20.0.0.0	Deliver Directly
30.0.0.0	Deliver Directly
10.0.0.0	Via 20.0.0.5
40.0.0.0	Via 30.0.0.7


Network Address
192.168.4.0/24 via 192.168.3.2
192.168.3.0/24 via 192.168.2.3
Network Address
192.168.1.0/24 via 192.168.2.2
192.168.2.0/24 via 192.168.3.1
Network Address
192.168.1.0/24 via 192.168.2.2
192.168.4.0/24 via 192.168.3.2
Net ID: 192.168.2.0
Net ID: 192.168.3.0
Net ID: 192.168.4.0
Net ID: 192.168.1.0
192.168.2.2
192.168.1.2
192.168.2.3
192.168.3.1
192.168.3.2
192.168.4.2
Router0
Router1
Router2
Switch4
PC-PT
192.168.1.7
192.168.1.1
192.168.2.1 Default Router192.168.2.2
192.168.2.5 Default Router 192.168.2.3
192.168.4.1
192.168.4.4
192.168.4.5

Classless Interdomain Routing (CIDR) or Supernetting

- ✓ **Supernetting**, also called Classless Inter-Domain Routing (CIDR), is a way to aggregate multiple Internet addresses (continuous range of IP addresses) of the same class.
- ✓ You create a supernet when you need to place more hosts on a single network (net ID) than currently will work in a classful configuration.

✓Using supernetting, the network address 192.168.2.0/24 and an adjacent address 192.168.3.0/24 can be merged into 192.168.2.0/23. The "23" at the end of the address says that the first 23 bits are the network part of the address, leaving the remaining nine bits for specific host addresses.

11000000. 10101000.00000010.00000000↔192.168.2.0
11000000. 10101000.00000011.00000000↔192.168.3.0

✓Supernetting is most often used to combine Class C network addresses and is the basis for most routing protocols currently used on the Internet.

✓For any class C IP address 192.168.1.0 and default subnet mask 255.255.255.0 we have 2^8-2 = 254 hosts. Let us now see how class C address can produce more than 254 hosts.

✓The basic principle is to take one or more bits from the net ID part as the host ID part. For example, if we use subnet mask of 23 bits instead of 24 bits of default subnet mask then we get 9 bits for host ID the number of hosts will be 2^9-2.

✓In this case net ID does not fall in any category hence called classless IP. Such mask is called CIDR mask.

Let the available IP addresses are 192.168.20.0 through 192.168.31.0 i.e. 12 continuous class C addresses. Listing the third byte in binary value provides the flowing results. The four leftmost bites of third byte are the same. Thus, we can implement a 20-bits subnet mask which allows 12 bits for the host addresses. The total number of hosts will be 2^{12}-2 = 4094.

Decimal	Binary of third byte
192.168.20.0	00010100
192.168.21.0	00010101
192.168.22.0	00010110
192.168.23.0	00010111
192.168.24.0	00011000
192.168.25.0	00011001
192.168.26.0	00011010
192.168.27.0	00011011
192.168.28.0	00011100
192.168.29.0	00011101
192.168.30.0	00011110
192.168.31.0	00011111

The entire IP addresses acts as a single IP hence reduce the size of table of a router.

Example-8
For the starting CIDR address of 192.168.10.0/20 determine the range of class C IP address.

Ans.

Decimal	Binary of third byte
192.168.10.0	00001010
192.168.11.0	00001011
192.168.12.0	00001100
192.168.13.0	00001101
192.168.14.0	00001110
192.168.15.0	00001111

The range of class C IP address is 192.168.10.0 to 192.168.15.0

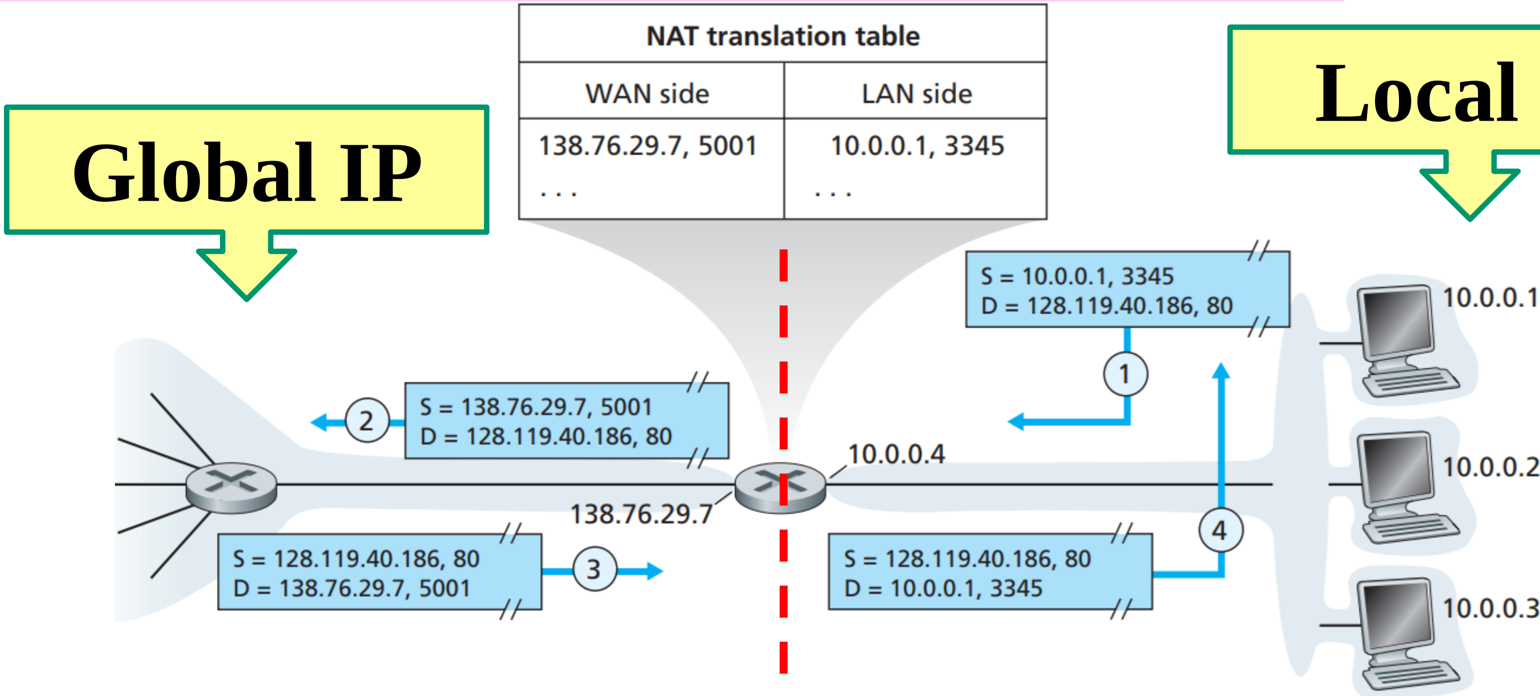
Example-9

Suppose you got three consecutive IP addresses: 203.100.200.0, 203.100.201.0 and 203.100.202.0 of class C.

IP address				
203.100.200.0	11001011	01100100	11001 000	00000000
203.100.201.0	11001011	01100100	11001 001	00000000
203.100.202.0	11001011	01100100	11001 010	00000000
Default subnet mask	11111111	11111111	11111111	00000000
Supernet mask	11111111	11111111	11111 000	00000000

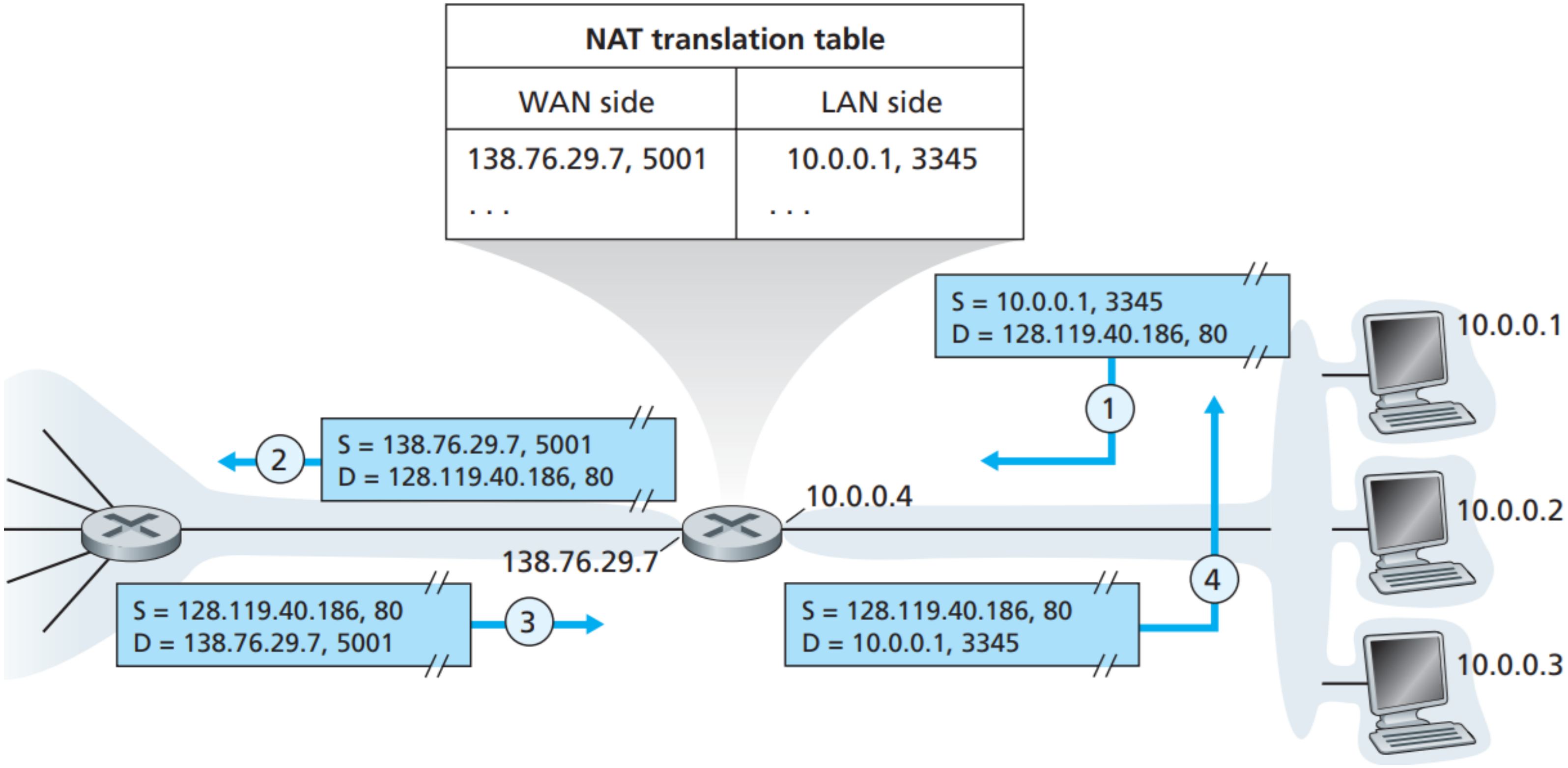
Therefore 8 subnet can be converted to a supernet using supernet mask of 255.255.248.0.

Network Address Translation (NAT)

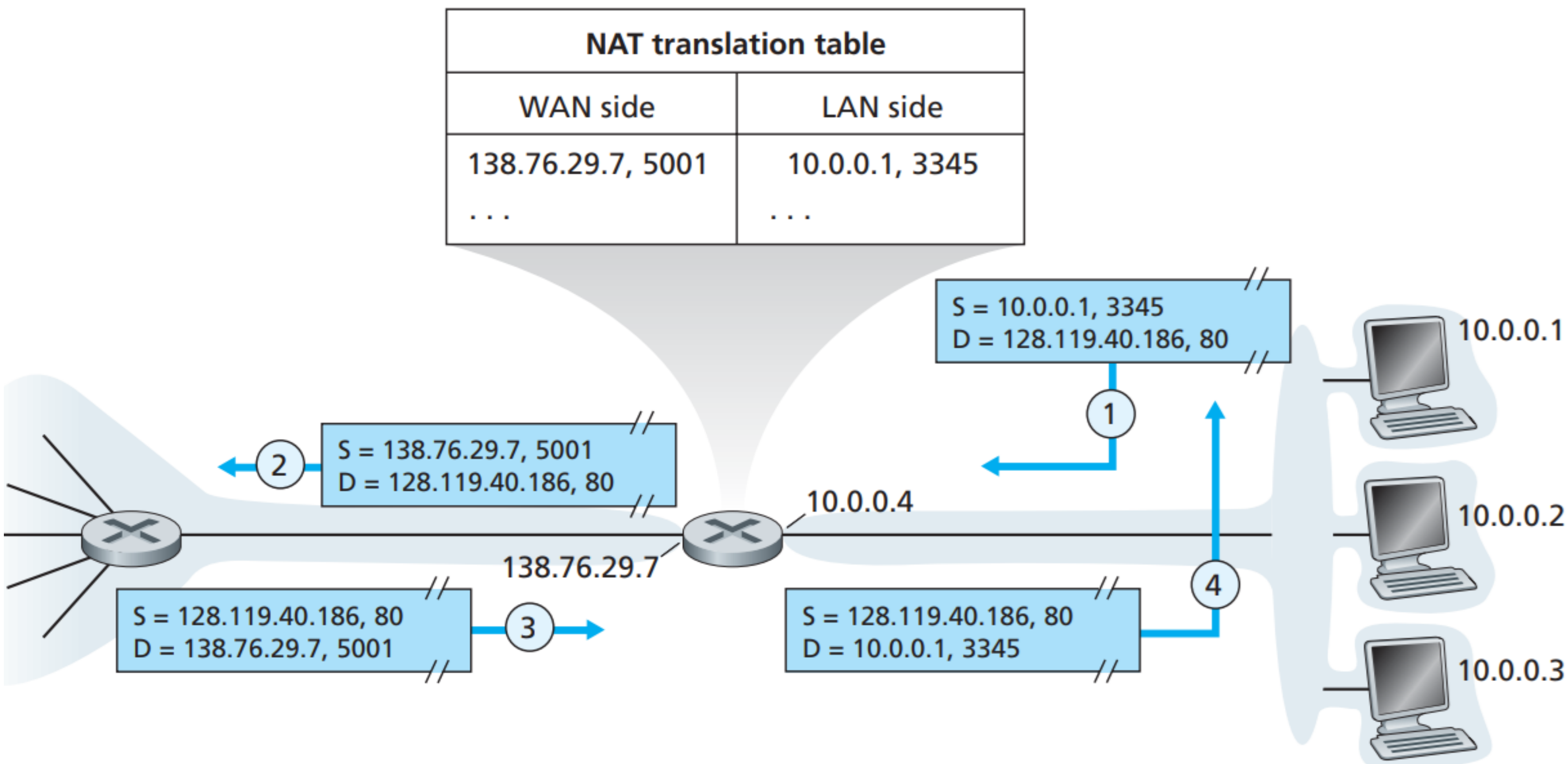


- ✓ Thousands of home networks, use the same address space, 10.0.0.0/24. Devices within a given home network can send packets to each other using 10.0.0.0/24 addressing.
- ✓ However, packets forwarded beyond the home network into the larger global Internet clearly cannot use these addresses (as either a source or a destination address).

The NAT router behaves to the outside world as a single device with a single IP address. In Figure below, all traffic leaving the home router for the larger Internet has a source IP address of 138.76.29.7, and all traffic entering the home router must have a destination address of 138.76.29.7.



The host 10.0.0.1 assigns the (arbitrary) source port number 3345 and sends the datagram into the LAN. The NAT router receives the datagram, generates a new source port number 5001 for the datagram, replaces the source IP address with its WAN-side IP address 138.76.29.7, and replaces the original source port number 3345 with the new source port number 5001.



IPv6

IPv6 uses 128 bit and expressed in 32 hexadecimal numbers like:

EFAC: BA89: 7529:AFDC: 92AF:8654:1293 :29A2

After every 4 digits a colon ‘:’ is used therefore 32 digits + 7 colons = 39 characters hence called addressing system of 39 characters.

In some addresses huge number of zeros exits like:

DFAC: 0000: 0000:0000: 0009:03AC1:5923 :FEA2

can be expressed as:

DFAC: 0: 0:0: 9:3AC1:5923 :FEA2

or

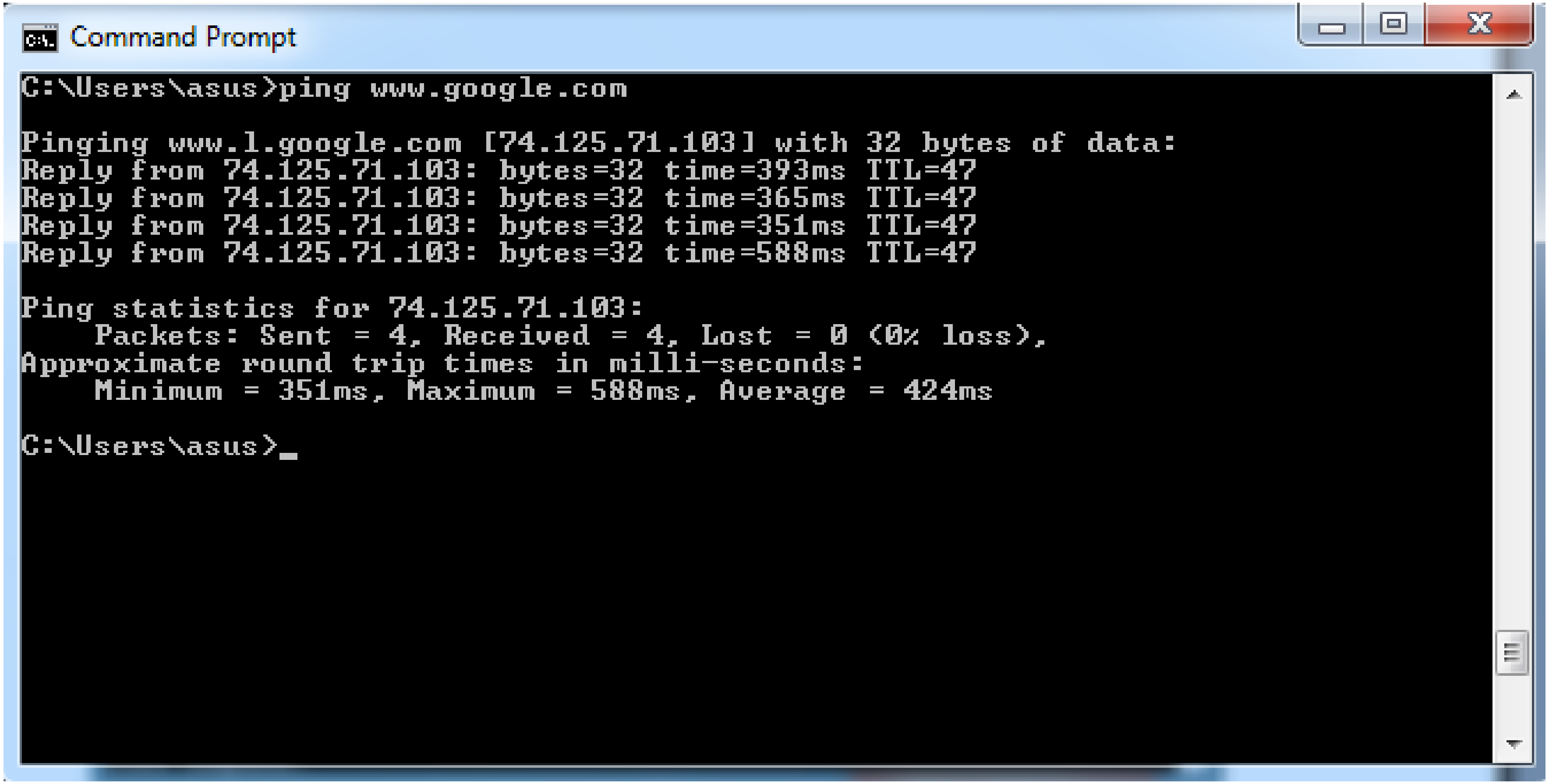
DFAC: : 9:3AC1:5923 :FEA2

Double colon can be used only once in a IPv6 address.

Try Running

Command Prompt

```
Microsoft Windows [Version 6.1.7600]
Copyright (c) 2009 Microsoft Corporation.  All rights reserved.

C:\Users\asus>tracert www.google.com

Tracing route to www.l.google.com [74.125.71.106]
over a maximum of 30 hops:

  1    <1 ms    <1 ms    <1 ms  192.168.2.201
  2    48 ms   101 ms    80 ms  10.10.1.1
  3    15 ms    15 ms    14 ms  123.49.60.209
  4    48 ms    19 ms    16 ms  123.49.13.94
  5   412 ms   429 ms   397 ms  1.9.241.73
  6     *        *        *     Request timed out.
  7   302 ms   307 ms   385 ms  72.14.215.22
  8   345 ms     *      384 ms  209.85.242.246
  9   384 ms   404 ms     *     209.85.243.113
 10   433 ms   444 ms   426 ms  216.239.43.19
 11   454 ms   354 ms   405 ms  216.239.48.230
 12   443 ms   429 ms   432 ms  hx-in-f106.1e100.net [74.125.71.106]

Trace complete.

C:\Users\asus>_
```


Command Prompt
C:\Users\asus>ping www.google.com
Pinging www.l.google.com [74.125.71.103] with 32 bytes of data:
Reply from 74.125.71.103: bytes=32 time=393ms TTL=47
Reply from 74.125.71.103: bytes=32 time=365ms TTL=47
Reply from 74.125.71.103: bytes=32 time=351ms TTL=47
Reply from 74.125.71.103: bytes=32 time=588ms TTL=47
Ping statistics for 74.125.71.103:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 351ms, Maximum = 588ms, Average = 424ms
C:\Users\asus>

```
C:\Users\asus>ipconfig

Windows IP Configuration


Ethernet adapter Bluetooth Network Connection 3:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :

Ethernet adapter Local Area Connection:

   Connection-specific DNS Suffix  . :
   Link-local IPv6 Address . . . . . : fe80::e885:2c6e:1a15:469a%16
   IPv4 Address. . . . . . . . . . . : 192.168.2.249
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Default Gateway . . . . . . . . . : 192.168.2.201

Wireless LAN adapter Wireless Network Connection:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :

Tunnel adapter isatap.{23ED35EE-B765-464B-8B33-B7016F274E1D}:
```

```
C:\Documents and Settings\Administrator>arp -a

Interface: 172.16.48.85 --- 0x2
  Internet Address      Physical Address      Type
  172.16.48.1           00-00-0c-07-ac-30     dynamic
  172.16.48.78          00-19-d1-4f-43-20     dynamic

C:\Documents and Settings\Administrator>_
```

Command Prompt

```
C:\Users\asus>pathping -q 2 -w 3 www.google.com

Tracing route to www.l.google.com [74.125.71.105]
over a maximum of 30 hops:
  0  asus-PC [192.168.2.249]
  1  192.168.2.201
  2     *     10.10.1.1
  3  123.49.60.209
  4     *        *     123.49.13.94
  5     *        *        *
Computing statistics for 2 seconds...
            Source to Here   This Node/Link
Hop  RTT    Lost/Sent = Pct  Lost/Sent = Pct  Address
  0                                           asus-PC [192.168.2.249]
                                0/   2 =  0%   |
  1    0ms     0/   2 =  0%     0/   2 =  0%  192.168.2.201
                                0/   2 =  0%   |
  2  115ms     0/   2 =  0%     0/   2 =  0%  10.10.1.1
                                0/   2 =  0%   |
  3   70ms     0/   2 =  0%     0/   2 =  0%  123.49.60.209
                                2/   2 =100%   |
  4  ---       2/   2 =100%     0/   2 =  0%  123.49.13.94

Trace complete.
```

Displays protocol statistics and current TCP/IP network connections.

```
C:\Documents and Settings\Administrator>netstat -an

Active Connections

  Proto  Local Address          Foreign Address        State
  TCP    0.0.0.0:135            0.0.0.0:0              LISTENING
  TCP    0.0.0.0:445            0.0.0.0:0              LISTENING
  TCP    127.0.0.1:2995         0.0.0.0:0              LISTENING
  TCP    127.0.0.1:2995         127.0.0.1:2996         ESTABLISHED
  TCP    127.0.0.1:2996         127.0.0.1:2995         ESTABLISHED
  TCP    172.16.48.85:139       0.0.0.0:0              LISTENING
  TCP    172.16.48.85:3008      85.17.72.66:80         TIME_WAIT
  TCP    172.16.48.85:3011      216.92.169.199:80      TIME_WAIT
  TCP    172.16.48.85:3014      94.75.236.122:80       TIME_WAIT
  TCP    172.16.48.85:3015      62.128.100.39:443      TIME_WAIT
  TCP    172.16.48.85:3016      94.75.236.122:80       TIME_WAIT
  UDP    0.0.0.0:445            *:*
  UDP    0.0.0.0:500            *:*
  UDP    0.0.0.0:1025           *:*
  UDP    0.0.0.0:1131           *:*
  UDP    0.0.0.0:1573           *:*
  UDP    0.0.0.0:1574           *:*
```

```
C:\Documents and Settings\Administrator>netstat -sp tcp

TCP Statistics for IPv4

  Active Opens                        = 1807
  Passive Opens                       = 1457
  Failed Connection Attempts          = 687
  Reset Connections                   = 29
  Current Connections                 = 4
  Segments Received                   = 49706
  Segments Sent                       = 46528
  Segments Retransmitted              = 210

Active Connections

  Proto  Local Address          Foreign Address        State
  TCP    pc_imdad_sir:2995      localhost:2996         ESTABLISHED
  TCP    pc_imdad_sir:2996      localhost:2995         ESTABLISHED
  TCP    pc_imdad_sir:3019      94.75.236.122:http     TIME_WAIT
  TCP    pc_imdad_sir:3020      180.211.201.22:http    ESTABLISHED
  TCP    pc_imdad_sir:3021      180.211.201.21:http    ESTABLISHED
  TCP    pc_imdad_sir:3023      wikipedia-lb.eqiad.wikimedia.org:http  TIME_WAIT
```

```
C:\Documents and Settings\Administrator>netstat -sp udp

UDP Statistics for IPv4

  Datagrams Received    = 12193
  No Ports              = 1494
  Receive Errors        = 110
  Datagrams Sent        = 1834

Active Connections

  Proto  Local Address          Foreign Address        State
```